

Timing of Early Laparoscopic Cholecystectomy for Acute Cholecystitis

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ABSTRACT

Objective: Although many surgeons advocate early laparoscopic cholecystectomy (LC) in acute cholecystitis, debate still exists regarding its optimal timing. This study compares the outcome of LC performed within and after 72 hours of admission in patients with acute cholecystitis.

Methods: Between January 2001 and December 2006, LC was performed in 196 consecutive patients with acute cholecystitis. Laparoscopic cholecystectomy was performed within 72 hours of admission in 82 patients (group 1) and after 72 hours in 114 patients (group 2). Data were collected prospectively.

Results: Both groups were matched in terms of age, sex, body mass index, fever, white blood cell count, and ultrasound findings. The overall conversion rate was 5%. No significant difference existed in conversion rates between group 1 (2.4%) and group 2 (7%) ($P=0.3$). The operation time (105 versus 126 minutes, $P=0.008$), complications (0% versus 6%, $P=0.02$), and total hospital stay (5 versus 12 days, $P<0.001$) were significantly reduced in group 1. No deaths occurred in this study.

Conclusion: Early LC can be performed safely in most patients with acute cholecystitis, but we recommend intervention within 72 hours of admission to minimize the complication rate and shorten the operation time and total hospital stay.

Key Words: Laparoscopic cholecystectomy, Acute cholecystitis, Conversion, Postoperative complications, Time factors.

INTRODUCTION

Acute cholecystitis as a major complication of gallstones is diagnosed in 10% to 35% of patients admitted for cholecystectomy.¹⁻³ The anatomy at Calot's triangle in acute cholecystitis is distorted due to adhesions. As such, cholecystectomy for this condition is technically demanding, time consuming, and results in high morbidity. In the prelaparoscopy era, the traditional management of patients with acute cholecystitis included initial conservative treatment to "cool down" the inflamed gallbladder followed by delayed open cholecystectomy (OC) several weeks later. This approach, however, was challenged by early OC, first advocated by Essenhigh in 1966.⁴ Since then, several randomized studies have shown that early OC for acute cholecystitis is as safe as delayed OC with reduced morbidity and hospital stay, lower costs, and rapid recovery.^{5,6}

It appears that laparoscopic treatment of acute cholecystitis is following the same trend as OC. Initially, laparoscopic cholecystectomy (LC) was contraindicated in patients with acute cholecystitis because of the fear of increased morbidity and high rates (60%) of conversion to OC that negate the advantages of laparoscopic surgery.⁷ Indeed, the bile duct injury of 5.5% during LC for acute cholecystitis was a major concern.⁸ On the other hand, initial medical treatment for acute cholecystitis followed by delayed LC is associated with several shortcomings.

First, 20% to 26% of patients fail to respond to conservative treatment or develop early complications during the first admission and require an urgent and technically demanding cholecystectomy.⁹⁻¹¹ Secondly, another 15% to 30% of patients are readmitted with recurrent symptoms and undergo an unplanned emergency cholecystectomy while waiting for their scheduled elective procedure.¹¹ Thirdly, a small proportion (2.2%) of patients is lost during the interval period.¹¹ Finally, at times the shrunken, scarred gallbladder and dense fibrotic adhesions at Calot's triangle make interval LC extremely difficult and unsafe.^{9,12}

As a result of these events and because of increasing experience and confidence in LC, the indications were extended to include patients with acute cholecystitis. Sev-

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eral randomized and nonrandomized studies have documented the feasibility and safety of early LC for acute cholecystitis in experienced hands.^{1-3,9,11-13}

In our setting, we have offered LC for all patients with symptomatic gallstones, and our initial experience with early LC in 45 cases of acute cholecystitis showed a low conversion rate and no major bile duct injury or mortality.²

The aim of this study was to determine the optimal timing of early LC for acute cholecystitis.

METHODS

This study included all consecutive patients who underwent early LC for acute cholecystitis at King Fahd Hospital of the University, Al-Khobar, Saudi Arabia, between January 2001 and December 2006. All the patients were admitted on an emergency basis. The diagnosis of AC was based on the presence of at least 2 of the following criteria: (1) acute upper abdominal pain and Murphy's sign, (2) fever $>37.5^{\circ}\text{C}$ and white blood cell count $>10 \times 10^9/\text{L}$, and (3) ultrasound findings of thick-walled gallbladder, ultrasound Murphy's sign, and pericholecystic fluid, in the presence of gallstones. Exclusion criteria included (1) patients who had no gallstones, (2) those who were not operated on, (3) those who had incomplete data, (4) those who had an OC to start with, (5) those who had delay due to obstructive jaundice, ascending cholangitis, biliary pancreatitis, or comorbid diseases.

Because previous reports, including our own experience,² have shown that LC for acute cholecystitis is best performed within 72 hours of admission, the patients were divided into 2 groups, depending on the timing of LC after admission: group 1 within 72 hours and group 2 after 72 hours.

On admission, all patients received intravenous second-generation cephalosporin plus metronidazole, which were continued for 24 hours after surgery.

Laparoscopic cholecystectomy was performed in both groups by 5 surgeons with similar distribution of early and delayed LCs and the same technique described previously.² No intraoperative cholangiography was performed in the series. Patients were followed up for 6 weeks and were discharged home unless they had postoperative complications.

The data were prospectively entered into a standardized form. Patient demographics, white blood cell count, ultrasound findings, time from admission to surgery, operation

time, conversion to OC, complications, postoperative stay, and total hospital stay were analyzed.

Statistics

Statistical analysis was performed using the *t* test, chi-square test, and Fisher's exact test, with significance set at $P < 0.05$.

RESULTS

Overall Results

There were 196 patients with acute cholecystitis; 56% were females, and the mean age was 41.3 years (range, 13 to 81). Laparoscopic cholecystectomy was performed within 72 hours of admission in 82 patients (group 1) and after 72 hours in 114 patients (group 2). Both groups were matched in terms of age, sex, body mass index, systemic manifestations, and ultrasound findings (**Table 1**). Conversion to OC was required in 10 (5%) patients. The mean operation time, including conversions, was 117.2 ± 54.6 minutes (range, 30 to 300). There were 7 (3.6%) complications; all were limited to group 2. The mean postoperative stay was 3.7 ± 2.5 days (range, 1 to 17), and the mean total hospital stay was 9.2 ± 5.6 days (range, 2 to 28) for all patients. No mortalities occurred in this study.

Conversion Rates

Table 2 shows that there were 2 conversions (2.4%) in group 1 and 8 in group 2 (7%) ($P = 0.3$). Obscure anatomy at Calot's triangle was the sole reason for conversion in group 1. The reasons for conversion in group 2 were obscure anatomy at Calot's triangle in 4 patients and difficulty to expose the gallbladder due to severe omental adhesions, inability to grasp the friable gallbladder, liver bleeding, and common bile duct injury in one case each.

Complications

No complications occurred in group 1. However, 7 (6%) complications occurred in group 2 ($P = 0.02$) and included 2 cases of respiratory infection, and a case each of CBD injury, retained CBD stone, subhepatic collection due to cystic duct leak, wound infection, and liver bleeding. The CBD injury was managed with immediate conversion and hepatico-jejunostomy. The liver bleeding required conversion and blood transfusion. Retained CBD stone was managed with endoscopic retrograde cholangiopancreatography (ERCP) and stone extraction. The case of cystic duct leak required ERCP and percutaneous drainage un-

Table 1.
Early Laparoscopic Cholecystectomy (LC) for Acute Cholecystitis: Patient Demographics*

Characteristics	Group 1 (n = 82) LC Within 72 h	Group 2 (n = 114) LC After 72 h	P Value
Age (years)	41.9 ± 14.1	40.9 ± 10.9	0.6
Sex (M:F)	39:43	47:67	0.4
Body mass index	29.9 ± 5.2	28.2 ± 6.8	0.06
Fever (>37.5°C), n (%)	53 (65)	67 (59)	0.4
Murphy's sign, n (%)	36 (44)	48 (42)	0.8
WBC† > 10×10 ⁹ /L, n (%)	71 (87)	100 (88)	0.8
Ultrasound results			
Gallstones, n (%)	100	100	—
Thick-wall gallbladder, n (%)	67 (82)	96 (84)	0.6
Pericholecystic fluid, n (%)	16 (20)	21 (18)	0.8
Ultrasound Murphy's sign, n (%)	36 (44)	48 (42)	0.8

*Data are presented as mean ± standard deviation unless otherwise indicated.

†WBC = white blood cell count.

Table 2.
Results of Early Laparoscopic Cholecystectomy (LC) for Acute Cholecystitis*

Characteristics	Group 1 (n = 82) LC Within 72 h	Group 2 (n = 114) LC After 72 h	P Value
Conversion, n (%)	2 (2.4)	8 (7)	0.3
Operation time (minutes)	105 ± 49.5	126 ± 56.9	0.008
Complications, n (%)	0 (0)	7 (6)	0.02†
Postoperative stay (days)	3.4 ± 2.2	4 ± 2.7	0.1
Total hospital stay (days)	5.1 ± 2.3	12.2 ± 5.3	<0.001

*Data are presented as mean ± standard deviation unless otherwise indicated.

†Fisher's exact test.

der ultrasound/CT guidance. The cases of respiratory and wound infections were managed conservatively.

Operation Time

The mean operation time was 105±49.5 minutes in group 1 and 126±56.9 minutes in group 2 (P=0.008).

Hospital Stay

The mean postoperative stay was 3.4±2.2 days in group 1 and 4±2.7 days in group 2 (P=0.1). The mean total hospital stay in group 1 was 5.1±2.3 days compared with 12.2±5.3 days in group 2 (P=0.001).

DISCUSSION

A review of the literature over the past decade shows that early and delayed LC for acute cholecystitis are safe with similar conversion rates, operation time, and overall complications.^{10,11,13,14} However, early LC results in significantly shorter hospital stay and avoids the risks of failed conservative treatment.¹⁵ Hence, most surgeons consider early LC as the optimum treatment for acute cholecystitis.^{9–11,13–16,17} This approach is well supported by a recent international consensus published as Tokyo Guidelines.¹⁸

With increased experience, improved skills, and new instruments, the high rates of conversion to OC, prolonged

operation time, and increased morbidity, particularly CBD injury, of early LC for acute cholecystitis have been dramatically reduced.^{3,11–13,14,16} Despite this acceptable level of outcome, acute cholecystitis remains the most significant risk factor for conversion and complications of LC. Furthermore, the timing for the procedure is a hotly contested issue and in all probability a strong predictor of success of LC for acute gallstone disease.¹⁷

In this series, the overall conversion rate (5%) to OC falls within ranges reported in prior studies.^{3,12} Conversion rates tend to have a wide range (0% to 39%)^{10,14,17} with an overall rate of 16%.¹⁵ These inconsistent results are attributed to differences in patient demographics, severity of inflammation, surgeon's experience, and timing of early LC. It is worth mentioning that the overall conversion rate of 5% in this study is similar to the 6.7% conversion rate reported in our initial experience² and probably reflects a sustained experience of the team in the management of acute cholecystitis. As expected, the most common reason for conversion among our patients was distorted anatomy at Calot's triangle due to inflammatory changes.

Although our rate of complications is generally acceptable (**Table 3**), all complications, including the single CBD injury, were limited to group 2 patients who had LC 72 hours after admission. It is worth noting that we had no single case of CBD injury in our initial experience with LC performed during the first 72 hours of admission for acute cholecystitis.² These findings clearly point to the importance of early intervention in acute cholecystitis.

The question of relating the timing of LC for acute cholecystitis to admission or onset of symptoms has been over-emphasized.^{1,9,19–21} In our view, it has little bearing on the procedure and its outcome. We believe that each clinical decision must be individualized. We do, however, concur that patient-physician factors, such as patient delay of more than 48 hours and a variable delay in diagnosis, influence surgical decisions and timing of intervention. These tend to vary considerably according to the population attitude to illness and type of health care facility.^{3,20}

Based on international experience and our own results, we support laparoscopic intervention within 72 hours of admission for acute cholecystitis. It is our observation that LC within this period is technically less demanding because the edema planes magnify the structures and facilitate dissection—an argument similar to historic findings in early OC for acute cholecystitis.

A compelling argument in favor of early LC for acute cholecystitis is the morbidity and escalating cost of pro-

Table 3.
Results of Trials Addressing Timing of Early Laparoscopic Cholecystectomy for Acute Cholecystitis

	Chandler 2000 ²¹				Bhattacharya 2002 ¹⁴				Stevens 2006 ³				Soffer 2007 ¹⁹				Al-Mulhim 2008			
	Early	Delayed	P*		Early	Delayed	P*		Early	Delayed	P*		Early	Delayed	P*		Early	Delayed	P*	
Delayed LC*	>72 hr from admission				>96 hr from admission				>24 hr from admission				>48 hr from admission				>72 hr from admission			
No. of patients	21	22	11	NS	22	132	121	–	132	121	–	–	693	1274	82	114	2 (2.4)	8 (7)	NS	NS
Conversion, n (%)	5 (24)	8 (36)	NS	0	0	0	–	NS	12 (9)	7 (6)	NS	NS	91 (13.1)	201 (15.8)	NS	NS	2 (2.4)	8 (7)	NS	NS
Mean OT* (min)	115	125	NS	NS	95	75	NS	NS	92	95	NS	NS	152	165	NS	NS	105	126	0.008	0.008
Morbidity, n (%)	2 (10)	2 (9)	NS	NS	1 (9)	1 (4.5)	NS	NS	9 (7)	11 (9)	NS	NS	NR	NR	–	–	0	7 (6)	0.02	0.02
Mean total stay (d)	5.4	7.1	0.01	0.01	5†	13†	<0.001	<0.001	2	3	<0.001	<0.001	NR	NR	–	–	5.1	12.2	<0.001	<0.001

*LC = laparoscopic cholecystectomy; OT = operation time; NS = not significant; NR = not reported.

†Median total stay.

longed waiting time for surgery following conservative treatment at index admission. Somasekar and colleagues in the United Kingdom²² found that 58% of patients were readmitted as emergencies, some with biliary pancreatitis, necessitating laboratory and X-ray investigations, thereby escalating the cost of emergency care by as much as £1544 per patient. Lawrentschuk et al²³ in Australia found that the cost per patient for emergency readmission while on the waiting list was \$A 6129 compared with \$A 3725 for an uncomplicated elective LC. This did not include emergency department costs, investigations, drugs, and procedures. In addition, these findings do not take into account the "patient suffering, loss of work hours and income, and the effect on the community as a whole."²³

In the realm of cost-benefit analysis, LC has been evaluated, and the overall cost of the procedure is cheaper than OC, mainly because the patient's stay in the hospital is shortened.^{21,24,25} The key question in the economics of LC is the overall hospital stay as end point. Analysis of 5 recent studies including our series (**Table 3**) shows that the total hospital stay is significantly less when LC for acute cholecystitis is performed early irrespective of the conversion. Stevens and colleagues³ reported a mean total stay as low as 2.6 days, and this is achievable now that the role of clinical pathways and specialist-led services are available in some countries. Caplan et al²⁶ in Australia prospectively studied the effect of reengineered surgical service (consisting of a perioperative unit, preadmission anesthetic assessment, day of surgery admissions, enhanced patient education, clinical pathways, and post-acute care) on total costs, patient satisfaction, time off work, and pain score in 224 patients. They concluded that besides high patient satisfaction with the treatment, the cost savings to the hospital outweighed the cost of increased services in the community. Mercer and colleagues²⁷ listed similar clinical and economic benefits in their specialist-led service for the management of acute gallstone disease in the United Kingdom. In addition, Uchiyama et al²⁸ in Japan highlighted the role of clinical pathways in reducing hospital stay and cost of laparoscopic surgery.

Our overall mean total hospital stay of 9 days is considerably longer than that reported in the current literature.^{3,10,16} Then ours is not an LC-specific facility, and LC for acute gallstone disease has to fit in with the rest of the operating room schedule. Besides, the service is shared by a multilayer training and assessment program. We also have to satisfy cultural and social demands of the population. As yet, there is no insurance-related scheme in our institution that would trigger the development and intro-

duction of specialist-led or reengineered service with suitable clinical pathways.

Our future plan of reorganization is on the drawing board, and we already have some of the components of a dedicated and specialist-led unit, ie, a short-stay/outpatient facility, and preadmission anesthesia clinic. We are hopeful that in future reporting the current halfway facility would evolve into a dedicated and internationally comparable laparoscopic unit.

CONCLUSION

Laparoscopic cholecystectomy for acute cholecystitis performed within the same admission is safe and associated with a low conversion rate and no mortality. However, LC should be performed as early as possible, preferably within the golden period of 72 hours after admission, to decrease the morbidity rate, operation time, and total hospital stay.

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